Y-Short Tandem Repeat Multiplex Systems — Y-PLEX™ 6 and Y-PLEX™ 5

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ABSTRACT: Y-Chromosome short tandem repeats (Y-STRs) have become a very useful tool in forensic casework, paternity, and male lineage studies. In forensic casework, one can obtain the male profile from a mixture sample containing male and female DNA. Two Y-STR genotyping systems, Y-PLEX™ 6 and Y-PLEX™ 5, have been developed for use in human identification. Y-PLEX™ 6 enables simultaneous amplification of DYS393, DYS19, DYS389II, DYS390, DYS391, and DYS385; Y-PLEX™ 5 enables simultaneous amplification of DYS389I, DYS389II, DYS439, DYS438, and DYS392 loci. The Y-PLEX™ 6 and Y-PLEX™ 5 systems together provide analysis of all nine Y-STR loci generating minimal haplotype and two additional loci, DYS438 and DYS439. These systems also provide analysis for all 11 Y-STR loci recommended by the Scientific Working Group on DNA Analysis Methods (SWGDAM) for forensic casework and population database studies. Both the systems were validated following the Federal Bureau of Investigation (FBI) Director's Quality Assurance Standards. Allelic ladders, which serve as a reference in genotyping, were generated. The nucleotide sequence of alleles in the allelic ladder was determined and the nomenclature is in accord with the recommendations of the International Society of Forensic Genetics (ISFG). The minimum sensitivity of the Y-PLEX™ 6 and Y-PLEX™ 5 systems was 0.2 and 0.1 ng of male DNA, respectively. The nonhuman study revealed that the primers in the Y-PLEX™ 6 and Y-PLEX™ 5 systems were specific for the DNA from humans and some higher primates. Mean stutter values ranged from 3.6 to 11.9%. The Y-PLEX™ 6 and Y-PLEX™ 5 systems were used in several forensic cases. The results from these multiplex systems have been admitted in various U.S. Courts. Thus, Y-PLEX™ 6 and Y-PLEX™ 5 genotyping systems are sensitive, reliable, and robust for use in human forensic and male lineage identification studies.

KEY WORDS: Y-chromosome, DNA typing, DYS19, DYS385, DYS389I, DYS389II, DYS390, DYS391, DYS392, DYS393, DYS438, DYS439, human identification, multiplex, polymerase chain reaction (PCR), Y-Plex, short tandem repeats (STRs), Y-STR.